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Capturing wild foods and neglected and underutilized species in dietary assessments at scale

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Capturing wild foods and neglected and underutilized species in dietary assessments at scale

FAO Giulia Muir (Forestry Division)
Simona Sorrenti (Statistics Division)
Maria Antonia Tuazon (Food and Nutrition Division)
Maria Cecilia Pastores (FAO Philippines)

Ghent University Giles Hanley-Cook
Carl Lachat

Philippines Department of Science and Technology – Food and Nutrition Research Institute Charina A. Javier
Imelda Angeles-Agdeppa

The Alliance of Bioversity International and CIAT Danny Hunter

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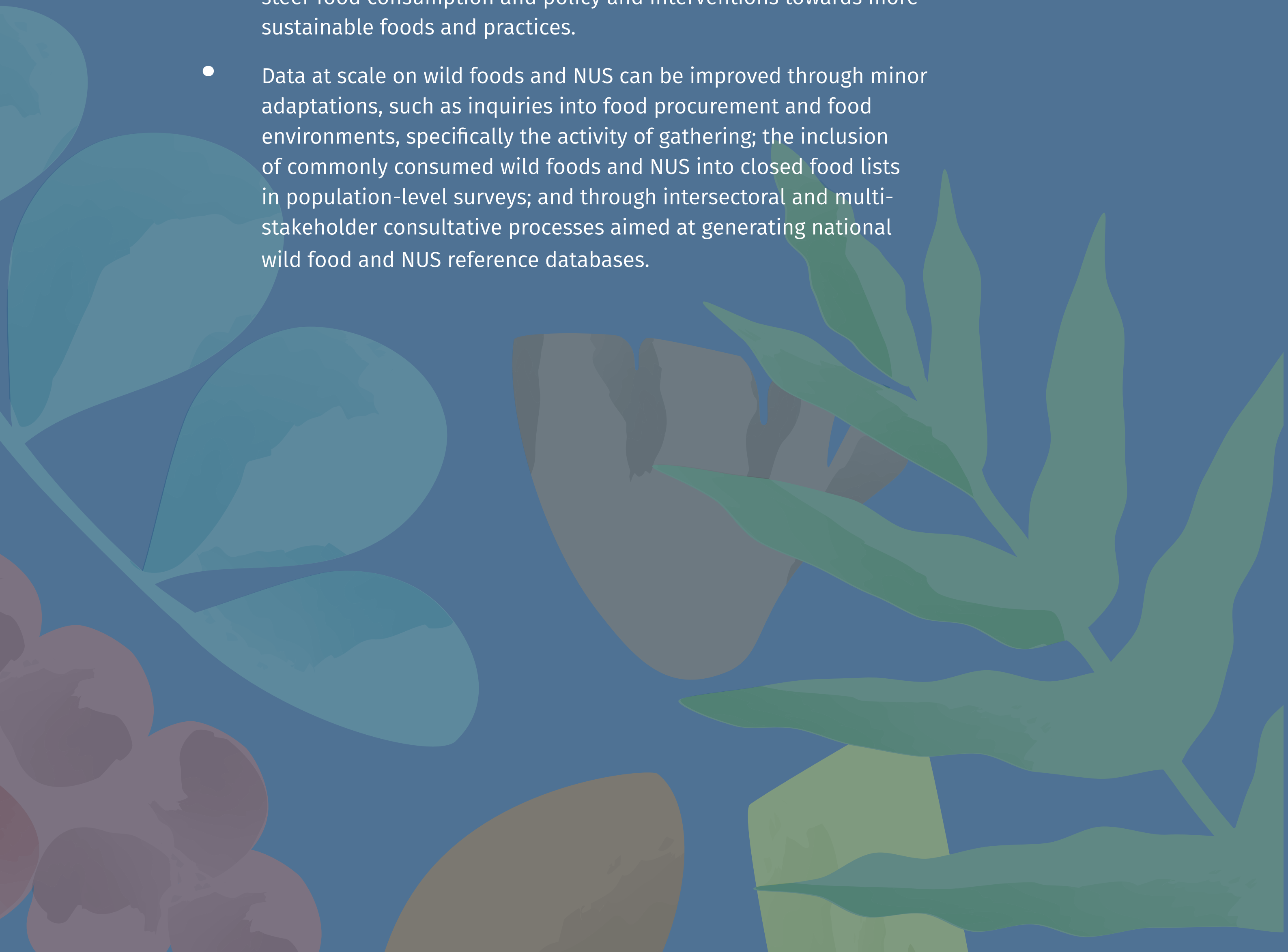
Key messages

- National food supplies are becoming increasingly similar in composition, limiting the biological diversity necessary for high-quality and sustainable diets.
- Underassessed foods such as wild foods and neglected and underutilized species (NUS) can help to diversify diets, and can often be nutritionally superior to cultivated counterparts. However, they are generally hidden, missing, inaccurately or insufficiently reported in official statistics, contributing to missed opportunities to steer food consumption and policy and interventions towards more sustainable foods and practices.
- Data at scale on wild foods and NUS can be improved through minor adaptations, such as inquiries into food procurement and food environments, specifically the activity of gathering; the inclusion of commonly consumed wild foods and NUS into closed food lists in population-level surveys; and through intersectoral and multi-stakeholder consultative processes aimed at generating national wild food and NUS reference databases.



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Executive summary

Food biodiversity is an essential element of diet quality and sustainable diets. Yet food production is dominated by a handful of crops, despite the thousands of edible species available in nature. Many of these foods fall under the category of wild or neglected and underutilized species (NUS). These species are largely overlooked in policy frameworks and interventions related to healthy diets and sustainable agrifood systems. Inadequate dietary assessment methods, limited food composition data, and inconsistent terminology and food classification contribute to significant underreporting — known as the "hidden harvest." As a result, their contributions to nutrition, livelihoods, and sustainability are underestimated, leading to missed opportunities for agrifood systems transformation.

Current dietary assessment tools and indicators are not well adapted to capture the consumption of biodiverse foods, particularly those that are seasonal or episodically consumed. Moreover, these methods are rarely implemented at scale due to complexity and cost. To address these gaps, this guidance outlines seven practical, minimal, steps to improve data collection on wild foods and NUS at scale. It also includes ten appendices with suggested templates to improve data collection, as well as examples from countries that have made adaptations to existing surveys. Finally, three case studies are featured from the Philippines, Thailand and from a global, interregional FAO project, all of which address different aspects of improving data on wild foods and NUS.

Introduction

Overview

Food biodiversity, or the diversity of edible plants, animals, and other organisms used for food, is one of the pillars of dietary diversity and an essential component of healthy and sustainable diets. Studies have shown that species rich diets, particularly of fruits and vegetables, contribute to micronutrient adequacy (Lachat *et al.*, 2018) and reduce mortality (Hanley-Cook *et al.*, 2021, 2025). Adequate intake of micronutrient-dense foods is essential to counter micronutrient deficiencies or “hidden hunger”, affecting over 2 billion people globally (Thompson, 2011). Biodiverse production systems are also more resilient to shocks such as climate-induced calamities. Yet at present, 66 percent of crop production relies on just nine plants – sugarcane, maize, rice, wheat, potatoes, soybeans, oil-palm fruit, sugar beet and cassava – and over 50 percent of our daily calories are supplied by only four crops: rice (*Oryza sativa*), maize (*Zea mays*), wheat (*Triticum spp.*) and potato (*Solanum tuberosum*). National food supplies moreover are becoming increasingly similar in composition, limiting the biological diversity necessary for high-quality diets (Khoury *et al.*, 2014; HLPE, 2017).

Contrary to modern farming, local, traditional agrifood systems are hotspots for genetic, landscape, ecological and dietary diversity. Within these systems, an estimated 10,000 wild species are used as food (IPBES, 2022). Many other neglected and underutilized species (NUS) on the spectrum from wild to cultivated, contribute to dietary diversity, quality, and rural development (Sunderland, 2023; Vogliano, 2021; Ulian *et al.*, 2020; Burlingame, 2019; Ickowitz, 2014; Hickey *et al.*, 2016; Termote, 2014; Vinceti *et al.*, 2012). Many wild species possess nutritional content superior to their domesticated counterparts (Burlingame, 2019; Borelli *et al.*, 2022) aside from having benefits that extend the value of foods into the realm of medicine (Kuhnlein, 1996).

Gathering wild edible plants and hunting animals takes place in both high as well as low-and middle-income countries, often irrespective of economic status of households (IPBES, 2022). Recent estimates suggest that the number of users of non-timber forest products (NTFPs) –wild and semi-wild biological resources harvested from rural and urban landscapes – may be as high as 5.8 billion, including 2.77 billion users in the global south (Shackleton and Vos, 2022). Although not confined to rural areas, people have foraged and managed hundreds of wild and semi-wild plant species in rural areas. Many are gathered from the forest, averaging 100 useful species per location, and between 300-800 aggregately per country (Bharucha and Pretty, 2010). Across India, this has reached as high as 1 403 species (Ray *et al.*, 2020). Most wild foods and NUS are produced in traditional food systems, suited to local conditions, closely linked to cultural heritage, are climate-resilient and generally have low carbon footprints (Laird *et al.*, 2024; Oraye, 2023). Wild foods and many NUS contribute to dietary diversity, quality and "seasonal evenness" - providing vital micronutrients and complementing many staple-based diets throughout the year (Powell, 2015).

Underassessed foods such as wild foods and NUS are often hidden, missing, or inaccurately and insufficiently reported from standard statistics. This makes recommendations about what to eat and grow arguably biased, contributing to missed opportunities to steer food consumption and policy towards more sustainable foods and practices (Halpern *et al.*, 2019). Many traditional, wild, and underutilized species have not been quantified for their nutritional attributes nor is systematic data on consumption available, despite being known and used by local communities and Indigenous peoples on a routine basis (Kew, 2020). It is estimated that so-called underassessed foods represent more than 25 percent of total food production in 40 countries and more than half of animal production in 76 countries (Halpern *et al.*, 2019). Piecemeal data collection on NUS, including wild foods, makes understanding their contributions to diets and assessing metrics and indicators a challenge (GAIN, 2023). Consequently, these foods, and Indigenous' and rural peoples' preferences for plant species tend to be overlooked in nutrition, agricultural interventions, crop improvement programmes and land restoration interventions. This has contributed to increasing homogeneity of the global diet and global landscapes (Laird *et al.*, 2024; Khoury *et al.*, 2014).

Greater convergence across sectors is needed around the importance of mainstreaming wild foods and NUS in relevant national policies guiding diets (e.g. food-based dietary guidelines [FBDG]), biodiversity (national biodiversity strategies and action plans [NBSAPs]) and climate (nationally determined contributions [NDCs] and national adaptation plans [NAPs]). A recent study indicates that 54 percent of country food-based dietary guidelines shows no intentional connectedness between climate and nutrition (Indicator 3.1, GAIN 2023). Supporting existing systems of traditional use and efforts to re-orient domestication towards greater food biodiversity are key pathways towards sustainable agrifood systems transformation and associated health, climate, and biodiversity targets (Laird *et al.*, 2024).

Rationale and scope

Data on use, availability, and composition of wild species and NUS in particular continue to be incomplete, particularly consumption at scale (Raneri *et al*., 2023; Medeiros *et al*., 2022; Muir *et al*., 2020; Sorrenti, 2017). Challenges exist in assessing the biological contribution of diverse plant and animal species to human diets (Lachat *et al*., 2018). Unharmonized and ambiguous terminology across countries (e.g. wild foods, semi-wild foods, wild food plants [WFP], wild edible plants [WEP]), bush foods, NTFPs, non-wood forest products (NWFPs), forest foods), methodological limitations, scarce food composition data, and their perception as famine foods or poor man's food are just some of the factors that have led to underreporting and quantification challenges (Muir *et al.,* 2020). For these reasons, wild foods, NUS and forest foods have historically been referred to as the "hidden harvest" (Cambell and Luckert, 2002).

Methodological limitations of non-adapted dietary assessment tools (e.g., quantitative 24-hour recall, food frequency questionnaire) to capture wild foods, episodically consumed or seasonal foods (which may be consumed in significant quantities, but only for limited periods of the year) are a major impediment towards understanding their contribution to diets and supporting existing systems of sustainable use. Existing indicators struggle to capture the contribution of biological diversity to diets (Lachat *et al*., 2018). The FAO's *Guidelines for the enumeration of the Minimum Diet Diversity for Women* (FAO, 2021) indicator provides brief guidance for capturing NUS, including wild foods, in dietary diversity questionnaires (DDQ). The FAO *Guidelines on assessing biodiverse foods in dietary intake surveys* (Kennedy *et al*., 2017) extensively elaborates on the potential adaptations of dietary assessment methods to capture wild species and NUS. Other methods to assess the contribution of biodiverse foods in dietary intake surveys also exist, such as Dietary Species Richness (DSR), a cross-cutting indicator measuring food biodiversity in human diets (Lachat *et al.,* 2018). However, most of these methods and adaptations are not routinely implemented at scale (Raneri *et al*., 2023), making conclusions about dietary contributions of biodiversity, trends and use by different segments of society difficult. Most of these approaches moreover tend to be sector-specific and administered in parallel (i.e. by health or forest sectors separately), with limited ability to make conclusions at a population level or integrate data across sectors (Pingali and Rickets, 2014).

Existing studies assessing wild food consumption and NUS have utilized more than one dietary intake method. This usually includes 24-hour recalls and food frequency questionnaires and repeat recalls on non-consecutive days. However, these methods require specific nutritional expertise and are financially and time-prohibitive for many countries (Raneri *et al.*, 2023). While no single method can assess dietary patterns or exposure perfectly and acknowledging the inherent trade-offs between specificity and comprehensiveness of data (FAO and World Bank, 2018), the present guidance summarizes essential, minimum steps and adaptations that can contribute to capturing consumption of wild foods, NUS and food biodiversity more generally in routine dietary assessments carried out at scale.

Background and intended users

The development of this guidance note was motivated by numerous calls[1] to improve the availability of globally comparable and population-level data on food biodiversity, in particular, wild species and NUS. Attention to these resources has been scarce in policy and planning, but there are clear opportunities to optimize their contribution to health, biodiversity, and climate (Laird *et al.*, 2024; IPBES, 2022; Muir *et al.*, 2020). The guidance note is aimed at survey planners and managers across sectors, health and development practitioners conducting monitoring and evaluation on nutrition outcomes, researchers and decision-makers interested in wild foods and NUS, biodiversity and forests, climate resilient and nutrition-sensitive policies and programmes to improve nutrition and food security and enhance the sustainability of food production. It was produced in collaboration with University of Ghent, and also draws on a pilot survey (**Case study 1**) conducted with the Philippines' Food and Nutrition Research Institute aimed at testing methods to capture consumption of food biodiversity, with specific inquiries into consumption of wild foods and NUS.

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[1] https://www.fao.org/3/nj925en/nj925en.pdf;
http://www.fao.org/3/ne205en/ne205en.pdf;
https://www.fao.org/3/nl148en/nl148en.pdf

Definitions

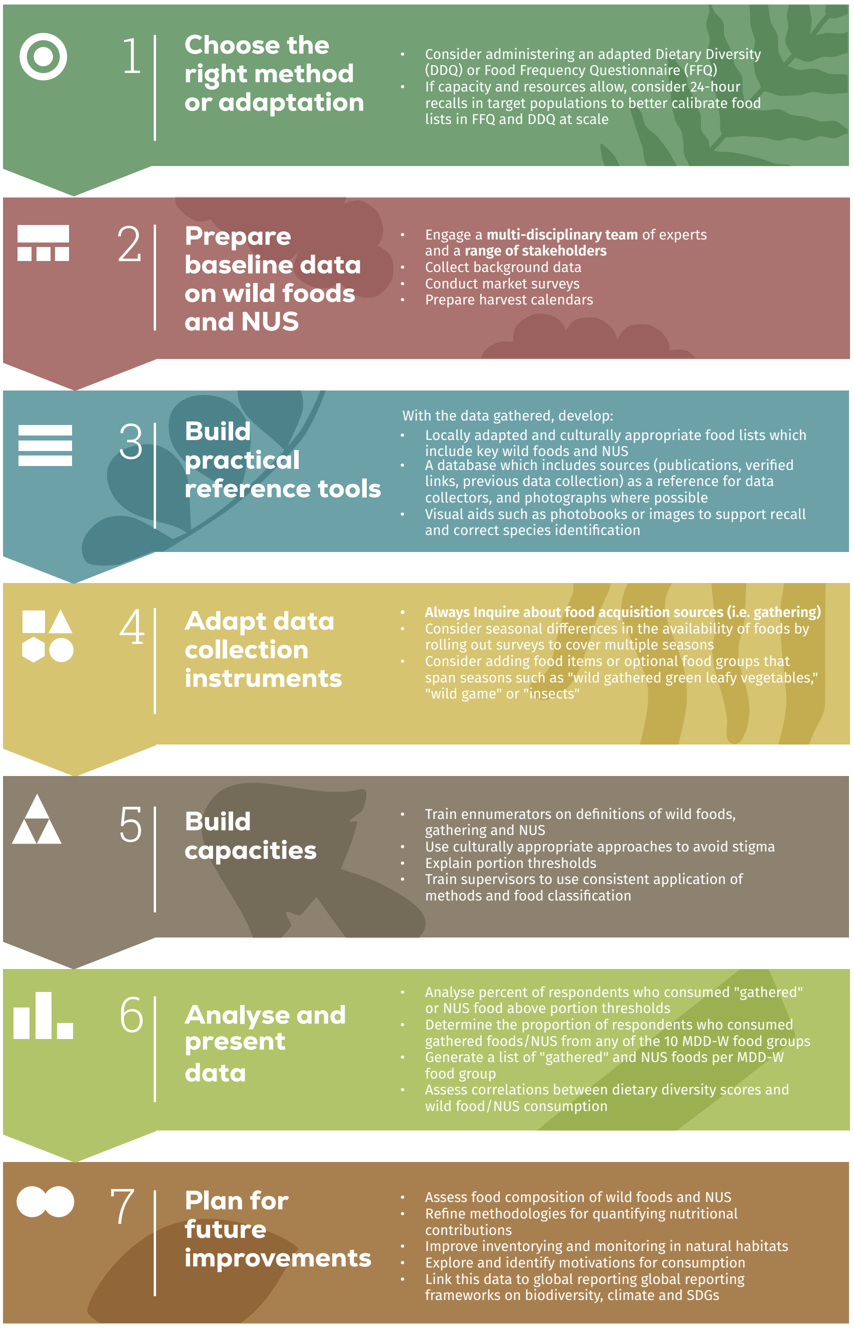
Wild foods are described here as untended biological resources obtained from gathering, or foods not grown intentionally (Muir *et al*., 2020). They include but are not limited to **NWFPs, NTFPs and forest foods** understood as foods obtained from forests and other wooded land. These foods may also fall under the umbrella term **neglected and underutilized Species (NUS).** Other terms commonly used include wild food plants, wild edible species, NTFPs, gathered foods, traditional foods, indigenous foods, among others, which refer to species that can survive independently of human intervention but that may also be to some degree of management, occurring between wild and domesticated (IPBES, 2022; Muir *et al*., 2020). It is important to note that species occur on a continuum from wild to harvested (Zeitler *et al*., 2024; Olesen *et al*., 2024; Muir *et al*., 2020), and they may be consumed in both wild and domesticated forms, making data collection challenging. For the purpose of capturing greater food biodiversity and consumption of foods produced outside of the farmed or cultivated food environment, the activity of **gathering** (i.e. collection of foods not grown intentionally) can be used as a proxy indicator for wild species use (Muir *et al*., 2020).

The term **NUS** refers to species that have received little attention or have been entirely ignored by agricultural researchers, plant breeders, and policymakers (Li and Siddique, 2018). They typically include wild or semi-domesticated varieties and NTFPs that are not usually traded as commodities. From a statistical and methodological perspective, however, the concept is not clearly defined nor is it recognized in international classifications and data-collection frameworks. As such, the focus of this Note is mainly wild (gathered) and semi-wild NUS which are not produced on an industrial scale. This focus serves as a technical entry point to address the broader challenges associated with generating reliable and comparable data on underassessed species.

Steps towards improving data at scale on wild foods and NUS

The present guidance identifies essential, minimum steps that can assist in data collection on wild foods and NUS in dietary assessments at scale (Figure 1). Adaptations include, for example: inquiries into food acquisition sources, in particular gathering and hunting; building national reference databases through multi-sectoral collaboration; and the inclusion of, at a minimum, key wild foods or food groups consumed into existing food lists.

Figure 1. Seven steps towards capturing wild foods and NUS consumption at scale



1 **Choose the right method or adaptation**
- Consider administering an adapted Dietary Diversity (DDQ) or Food Frequency Questionnaire (FFQ)
- If capacity and resources allow, consider 24-hour recalls in target populations to better calibrate food lists in FFQ and DDQ at scale

2 **Prepare baseline data on wild foods and NUS**
- Engage a **multi-disciplinary team** of experts and a **range of stakeholders**
- Collect background data
- Conduct market surveys
- Prepare harvest calendars

3 **Build practical reference tools**

With the data gathered, develop:
- Locally adapted and culturally appropriate food lists which include key wild foods and NUS
- A database which includes sources (publications, verified links, previous data collection) as a reference for data collectors, and photographs where possible
- Visual aids such as photobooks or images to support recall and correct species identification

4 **Adapt data collection instruments**
- **Always Inquire about food acquisition sources (i.e. gathering)**
- Consider seasonal differences in the availability of foods by rolling out surveys to cover multiple seasons
- Consider adding food items or optional food groups that span seasons such as "wild gathered green leafy vegetables," "wild game" or "insects"

5 **Build capacities**
- Train ennumerators on definitions of wild foods, gathering and NUS
- Use culturally appropriate approaches to avoid stigma
- Explain portion thresholds
- Train supervisors to use consistent application of methods and food classification

6 **Analyse and present data**
- Analyse percent of respondents who consumed "gathered" or NUS food above portion thresholds
- Determine the proportion of respondents who consumed gathered foods/NUS from any of the 10 MDD-W food groups
- Generate a list of "gathered" and NUS foods per MDD-W food group
- Assess correlations between dietary diversity scores and wild food/NUS consumption

7 **Plan for future improvements**
- Assess food composition of wild foods and NUS
- Refine methodologies for quantifying nutritional contributions
- Improve inventorying and monitoring in natural habitats
- Explore and identify motivations for consumption
- Link this data to global reporting global reporting frameworks on biodiversity, climate and SDGs

Source: Adapted from **Kuhnlein, H. V., Smitasiri, S. Yesudas, S., Bhattacharjee, L., Dan, L. & Ahmed, S**. 2006. *Documenting Traditional Food Systems of Indigenous Peoples:Guidelines for Procedures.* International Development Research Centre, Ottawa, Canada and FAO, Rome.

STEP 1

Choose the right method or adaptation

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STEP 1

Choose the right method or adaptation

Before beginning, decide which dietary assessment method (or combination of methods) best fits the country and local context, available resources and survey objectives. Different tools vary in accuracy, scalability, and cost, and each has implications for capturing wild foods and NUS. Dietary intake methods such as weighed food records and 24-hour recalls, for example, are perceived as gold standard methods for assessing diet quality, yet they require specific nutrition expertise, can be financially and time-prohibitive, and have rarely captured food biodiversity at scale (Raneri *et al.*, 2023).

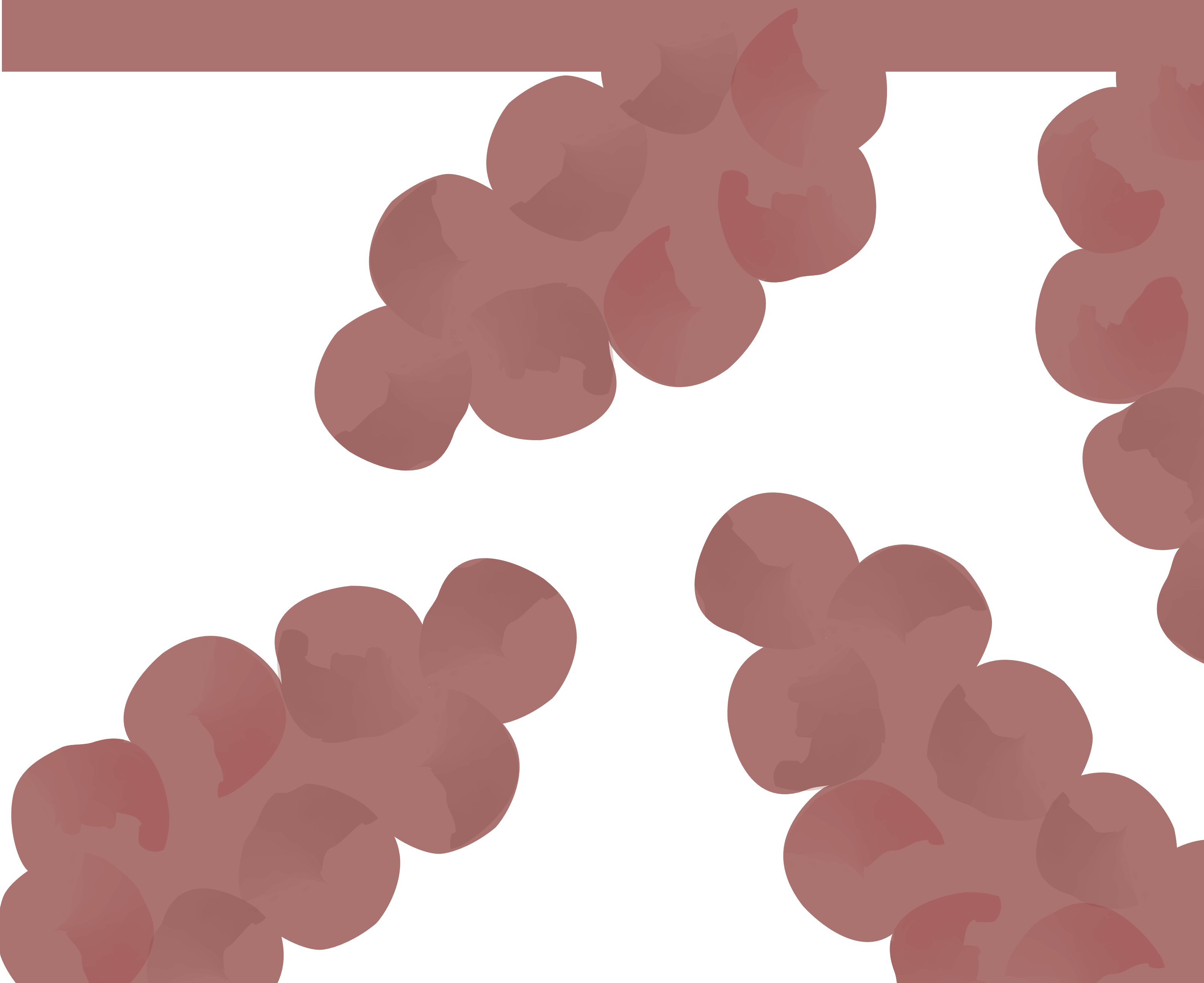
Simple, inexpensive assessment methods such as the DDQ, Minimum Dietary Diversity-Women (MDD-W), FFQ, and related indirect methods such as household consumption and expenditure surveys are likely to yield more information at least on main/popular wild food and NUS consumption at scale with minor adaptations. At the same time, in the long run, it will be more likely for population-level data on wild species and NUS to be collected systematically if existing country data-collection methods that are routinely carried out are adapted or improved (**Case study 1**). Hence, adaptations should be tailored to country capacities and experiences, and may also consider a blend of methods if capacity allows. For example, a 24-hour recall may be administered in a target population to better tailor food lists in national or subnational administration of a FFQ or DDQ. Conversely, a rapid FFQ on wild foods and NUS may be added to existing country methods to obtain an overview of key foods consumed, and better tailor existing methods.

Guidance

Match the method to country context, resources and survey capacity (refer to **Appendix 1**). Consider mixed-methods approaches (e.g. 24-hour recall for calibration, FFQ or DDQ for scale).

STEP 2

Prepare baseline data on wild foods and NUS



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STEP 2

Prepare baseline data on wild foods and NUS

Once a method is selected, gather available information on wild foods and NUS to support the design of survey tools. This preparatory stage ensures that survey instruments are context-specific and culturally appropriate. While entailing a fair amount of work, this exercise can generate baseline data that can be a useful reference point for future surveys.

2.1 Engage a multidisciplinary team and consult a range of stakeholders

Prepare a multidisciplinary team of experts and engage a range of stakeholders, in particular Indigenous Peoples and Local Communities (IP&LCs), to understand dietary food use, motivations for consumption, cultural context, food environments, and to support identification of plant and animal species commonly consumed. This knowledge can eventually support the development of food lists, which include key wild foods or NUS where appropriate, and support the generation of reference databases (**Step 3**). Leveraging focus group discussions, key informant interviews (e.g. local women, Indigenous Peoples), and nutrition, ethnobotanical, zoological, and anthropological expertise, (locally) consumed gathered foods (i.e. wild) and NUS can be identified. Focus groups with IP&LCs should be conducted in different agroecological zones if feasible, and participants should be encouraged to share and/or obtain samples of wild foods or NUS if in season. A common challenge when recording wild food and NUS species is the vast variety of local names utilized. The Philippines, for example, has over 185 ethnolinguistic groups. Consultations with communities and relevant experts are vital to ensure the reference database generated is accurate. The support of a taxonomist is indispensable for species identification. Gender-specific focus groups can be created if deemed more socio-culturally appropriate. Refer to **Appendix 2** for a sample template for focus group discussions and **Case studies 1 and 2.**

2.2 Collect background data

Previously collected (quantitative) dietary assessment data or national inventories of wild foods and NUS, if available, and published/grey literature can be rich sources of information on (contextual) food consumption. Consult experts to map existing data or studies, grey literature and project reports, for example, that can support the development of a wild foods and NUS database, and the generation of more complete food lists that include key wild foods and NUS. Assemble these data by agroecological zone or region, plant parts or organs used, and classify into food groups if this information is available. Identification of cultivation status (e.g. wild-gathered, semi-wild [managed] and/or farmed or planted intentionally) a priori can also save time in the data analysis phase, and eventual classification of foods (**Appendix 3**).

2.3 Conduct market surveys

Access to dietary quality can be improved by enhancing the market supply of nutritious foods (Pingali and Rickets, 2014). Yet the quality and diversity available in the local food supply may not be evident through food consumption questionnaires. Lack of market-level food diversity can however partly explain why the quality of households' diets may be poor and may help to better target interventions (Pingali and Rickets, 2014), keeping in mind other factors such as access and affordability. Prior to data collection, market surveys can be carried out to obtain detailed information about wild foods and NUS sold and bought (**Appendix 4**). This information can help capture foods that may be gathered at their origin but purchased rather than harvested directly by households or individuals. In addition to assessing biodiversity in the local landscape, markets can be surveyed to identify the costs of wild foods and in turn, households' economic access. Information may also be collected on existing food preparation or processing techniques used to enhance shelf-life, if any, and food safety and handling conditions or concerns. Different markets should be surveyed where and when possible, spanning agroecological zones. This information can contribute to generating baseline data that include wild foods and NUS that are typically purchased, and at the same time support "interventions" that can support access to and sustainable use of wild foods and NUS.

2.4 Prepare wild food and NUS harvest calendars

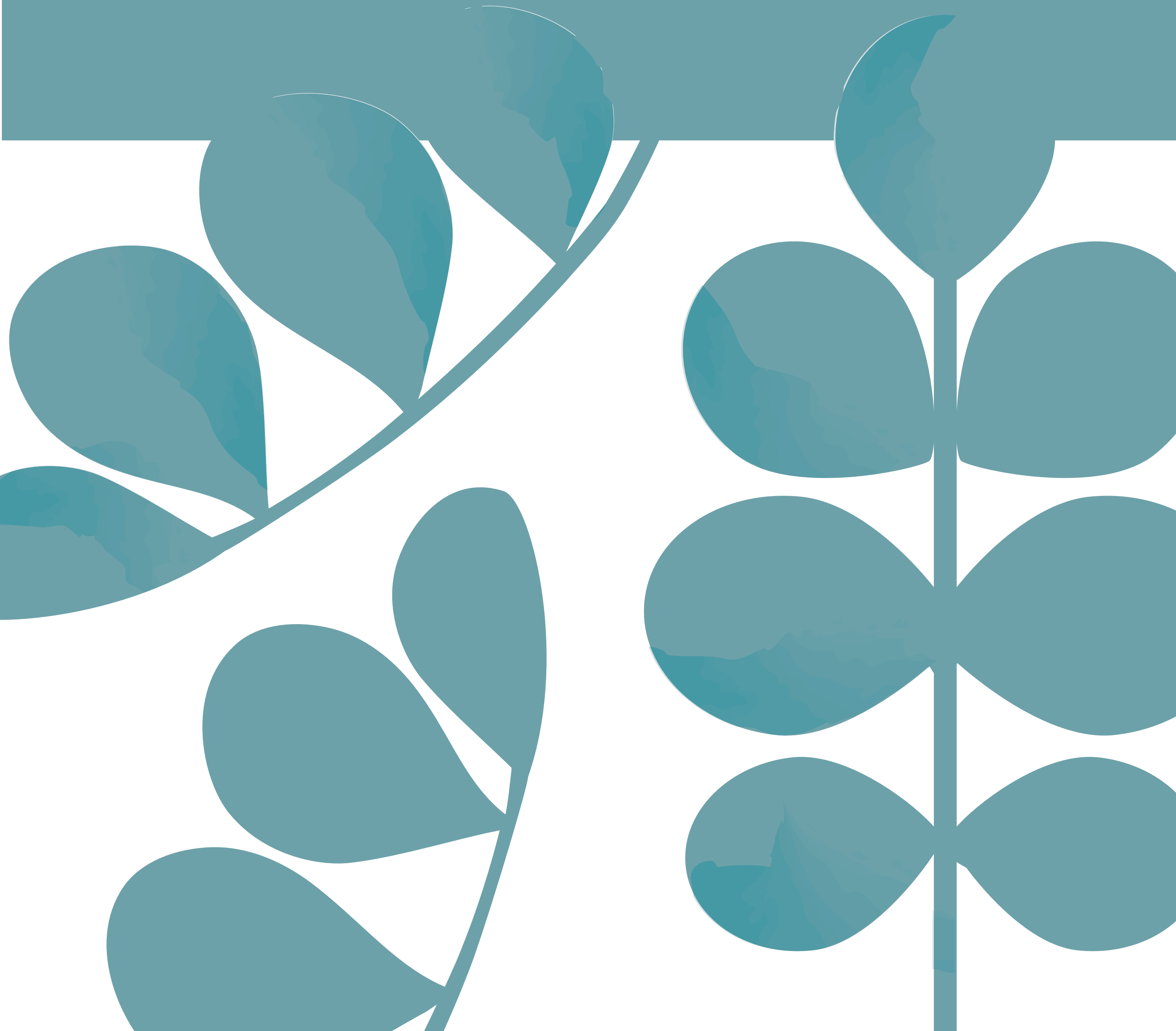
Seasonality is a key factor in determining food availability, particularly of perishable foods like fruits and vegetables. It is important for managing and using agrobiodiversity, as well as understanding access to food (Lochetti *et al.*, 2020). Mapping the availability of wild foods and NUS throughout the year through targeted focus group discussions, expert and key informant interviews (KIIs) can provide enumerators with critical background knowledge, and support those probing for wild foods and NUS. It also has the added value of providing a better understanding of the food environment and managing food biodiversity. Enumerators can be better supported to capture wild food consumption if they have information on harvest periods of key foods, and peak harvest periods. In the Philippines, for example, consumption of the popular wild edible fern *Pako* (*Diplazium esculentum*) peaks during the months of June and July (Muir *et al.*, 2026). A wild food and NUS harvest calendar can be prepared through a desk review before focus group discussions or KIIs, and further refined with supporting information collected during these activities. For more information, refer to **Appendix 5** or Lochetti et al., 2020.

Guidance

With the information gathered from consulting a range of stakeholders, background data, literature and surveying markets, a baseline inventory can be generated to prepare tools such as reference databases and photobooks (Step 3) to support data collection.

STEP 3

Build practical reference tools



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STEP 3

Build practical reference tools

Based on the baseline data generated, develop tools that enumerators and survey teams will use in the field. These tools should simplify species identification, standardize food recording and capture biodiversity in a way that is practical at scale.

Locally adapted and culturally appropriate food lists: An extensive, context-specific food list should be developed where the local food items (including gathered foods) have been categorized into each food group. Sentinel food lists are generally not appropriate, as it is unlikely that a wild, NUS, or forest food is one of the ~7 most consumed foods from a particular food group. Include culturally important, seasonal and commonly gathered foods. In large-scale surveys (e.g. regional or national MDD-W prevalence estimates collected during Demographic and Health Survey or Gallup World Poll) covering a wide range of agroecological zones, IP&LCs and languages, it may only be possible to integrate a limited number of wild foods and NUS into proxy dietary assessment tools. This number will also depend on the capacity of the respondents and enumerators to distinguish between similar foods (less problematic and likely more appropriate in the context of DD/MDD-W, for example, if only food source is of interest e.g., gathered versus own-production, but more so if specific wild foods or NUS are of interest), and on the need to keep the questionnaire (e.g. list-based 24-hour recall) within reasonable size so that it does not become too burdensome to administer (Kennedy *et al.*, 2017). Longer food lists that may include a greater variety of foods have been associated with reduced enumerator and respondent compliance and do not necessarily imply better quality data (FAO & World Bank, 2018). Consult Kuhnlein *et al.*, 2006, which contains timeless insights for generating traditional food lists.

Reference database: A reference database of wild foods and NUS can assist data collectors using open-recall methods to support probing and prompting, as well as the development of context-specific food lists for list-based methods. The database should include taxonomic, local names, dietary food use, food composition data if available and harvest periods. The information may also be supported with biophysical data on distribution, made available by forest and environment entities (**Case Studies 2** and **3**).

Visual aids: The development of visual aids such as photobooks or images can support recall and correct species identification, as respondent's ability to recall different species, varieties and cultivars is usually poorer in urban areas (e.g. photobook of widely consumed gathered foods for list-based 24-hour recall). In addition, photographs can be used as a training aid for enumerators (e.g. open 24-hour recall). Different varieties (i.e. gathered versus cultivated) within the same species may have a different colour (e.g. apples), shape (e.g. eggplants), or size (e.g. banana).

Guidance

With the data generated in Step 2, food lists inclusive of popular wild foods or NUS consumed can be developed (closed list), or tools such as reference databases and photobooks can be utilized to probe for popular wild foods or NUS (open ended). Food photobooks are particularly powerful aids to reduce recall bias and ensure shared understanding. Co-developing tools with communities can also increase cultural relevance and accuracy (**Case studies 1, 2 ,3**). Returning data to communities moreover builds ownership and encourages local initiatives for sustainability.

Box 1: Biodiversity Nutritional Composition Database hosted under the System on Brazilian Biodiversity

In Brazil, the Biodiversity Nutritional Composition Database hosted under the System on Brazilian Biodiversity (SiBBr) is the result of coordination between the Ministry of the Environment and the Ministry of Science, Technology, Innovation and Communications. The platform includes both food composition data and a bank of recipes of Brazilian native species (Hunter *et al.*, 2019). The database incudes nutritional information and receipts on wild food plants and neglected and underutilised species such as Acai (*Euterpe oleracea*), Bacuri (*Platonia insignis*), buriti (*Mauritia flexuosa*), brazil nut (*Bertholletia excelsa*), camu-camu (*Myrciaria dubia*).

Sources:

Hunter, D., Borelli, T., Beltrame, D.M., Oliveira, C.N., Coradin, L., Wasike, V.W., Wasilwa, L., Mwai, J., Manjella, A., Samarasinghe, G.W. and Madhujith, T., 2019. The potential of neglected and underutilized species for improving diets and nutrition. *Planta*, 250(3): 709-729.;

Hunter, D., Borelli, T. & Gee, E. 2020. *Biodiversity, food and nutrition: A new agenda for sustainable food systems.* 1st ed. Issues in Agricultural Biodiversity. Oxon (UK): Routledge.

STEP 4

Adapt data collection instruments

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STEP 4

Adapt data-collection instruments

When the reference tools are ready, prepare to adapt the survey instruments (e.g. questionnaires, recall sheets, coding systems) so that they can capture wild foods and NUS more effectively. Adjustments should reflect local food environments and seasonal realities.

4.1 Inquire about food acquisition, especially "gathered" food sources

Inquiring about food acquisition sources is likely the single most important adaptation that can contribute to capturing wild food consumption at scale, provided a unique food source code for gathering (and separate codes for hunting and fishing for animal species) is utilized. Healthy diets are constructs of both dietary patterns but also the ecological environment and biodiversity in which foods are sourced from (Fanzo, 2020). Collecting data on food acquisition, even if the focus is consumption, is particularly useful when there is a food security interest (FAO and World Bank, 2018). Like MDD-W adaptation, an additional column could be included to capture primary and possibly secondary food sources (Swindale *et al*., 2006) (**Appendix 6**). This is particularly useful at a food item level. This information has the added value of improving understanding of food environments, particularly with regards to availability and physical and economic access to an array of nutritious foods. In India, this integration into a nationally representative survey revealed that wild food collection contributed at least 77 percent greater dietary diversity than households not consuming wild foods (**Appendix 7**). Yet many surveys do not provide food source codes for gathering. If they do, gathering is often conflated with hunting and fishing, which may lead to respondent hesitancy due to the illegal nature of hunting in some local contexts. Survey planners may consider introducing gathering as a unique form of food acquisition at the beginning of food source options. This can relay useful information for food security and nutrition as well as land-use planning, particularly if these data are geo-referenced. While purchased wild foods cannot be captured through this approach (*see 2.3 Conduct market surveys*), it can still yield important information on food acquisition practices. There may be nonetheless reluctance and hesitancy to report on gathering due to perceptions of wild foods as poor man's foods or famine foods, or fear of apprehension since harvesting or sales may be illicit. Training enumerators to probe for gathering practices in a community-sensitive manner can be useful (**Step 5**).

4.2 Closed list or open recall?

Regardless of the data collection method (e.g. list-based or open recall), the identification of local and context-specific food items to be classified into each food group is required (**Appendix 8 and 9**). It is important to note, however, that as large-scale data-collection efforts are moving towards list-based recalls, the **closed food list** may be preferred for capturing wild and NUS foods. It is easy to administer and does not have a significant post-data collection burden. At the same time, an **open recall** may already be employed in certain countries depending on the capacity of the lead agency. The closed list will require a fair amount of preparatory work to determine available wild foods and NUS, with potential increase in bias in reporting. At the same time, open-recalls have been found to generate foods that often cannot be taxonomically verified.

During the selection of a data-collection method, an open recall may be more appropriate if (ethno) botanical or zoological expertise of locally gathered foods is not available during the a priori development process of the dietary assessment method (or photobook). Nonetheless, a posteriori, such expertise remains crucial to identify consumed wild, NUS, or forest species from non-quantitative open-recall data. Moreover, the open 24-hour recall method is more flexible to accommodate high level of respondent specificity, potentially missed during the elaboration of the closed food list (i.e. sentinel food lists are too narrow to capture episodically gathered foods), such as local name of the variety, as well as description of the part of the plant or animal (root, leaf, seed, fruit, head, liver, eyes) consumed.

4.3 Seasonality linked to wild foods

Survey planners should keep in mind **seasonal differences in the availability and use of wild foods,** which often leads to underreporting of food consumption. Prepare for survey administration and timing by keeping in mind seasonal constraints on the availability of different foods linked to gathering or hunting. It may be possible to adapt surveys according to season. In countries where wild food consumption is common practice, consult harvest calendars (*see 2.4 Prepare wild food and NUS harvest calendars*) and consider seasonal adaptations of food lists if there is significant pre-survey evidence to suggest they may be a culturally important food. Consult national inventories of wild foods and NUS if available (Refer to FAO, 2021, p.45).

While rolling out surveys to cover multiple seasons (e.g. rainy or dry season) is the preferred practice to overcome this challenge, it may not be feasible from a time or resource perspective. While some wild foods may not be available at the time of survey administration, the likelihood is that one or another will be available in any given month of the year. Include or probe for food items such as “wild-gathered green leafy vegetables”, for example, or “wild game,” which may capture consumption regardless of survey timing. In Malawi, this integration revealed that 22 percent of the sampled population consumes gathered green leaves (2019-2020) (**Appendix 9**). Other seasonal foods such as “gathered wild fruits” may be considered because there is added value in knowing who are consuming them to potentially contribute to filling nutrient gaps. However, it may be more difficult to include them in, for example, dietary diversity count because of the diversity of species and variability in nutrient content.

4.4 Optional food groups

Based on FAO’s guidance on food biodiversity (FAO, 2021), survey planners undertaking DDQ/MDD-W can expand on one or more of the dietary diversity food groups of the questionnaire when these foods are part of the culture, especially when they are extremely good sources of nutrients (**Appendix 10**). *“Even if only used by a small percentage of persons, it is important to ask about them,”* (FAO, 2012) given the added value for reaching nutrition outcomes, informing land-use decisions and preserving knowledge on culinary capital and heritage. As mentioned, it may be more difficult to include them in dietary diversity count or to quantify nutritional contribution because of the diversity of species, variability in nutrient content, or unknown nutrient composition altogether. If this information is not available, they can still be included as **optional food groups**. This has been done with insects and small protein foods and red palm oil, for example (**Appendix 10**).

Guidance

- Always add a unique code for "gathered" foods (separate from hunting, fishing, or other food sources).
- List-based = efficient, easy to scale; Open recall = flexible, but requires posterior identification of species, which can be time consuming.
- To overcome seasonality challenges, consider questions or probing for food items/food groups that can capture multiple species or varieties, for example, "wild gathered green leafy vegetables" or "wild game".
- For DDQ/MDD-W, consider optional food groups if they are an important part of culture (e.g. insects, wild gathered green leafy vegetables) or boast important nutritional value.

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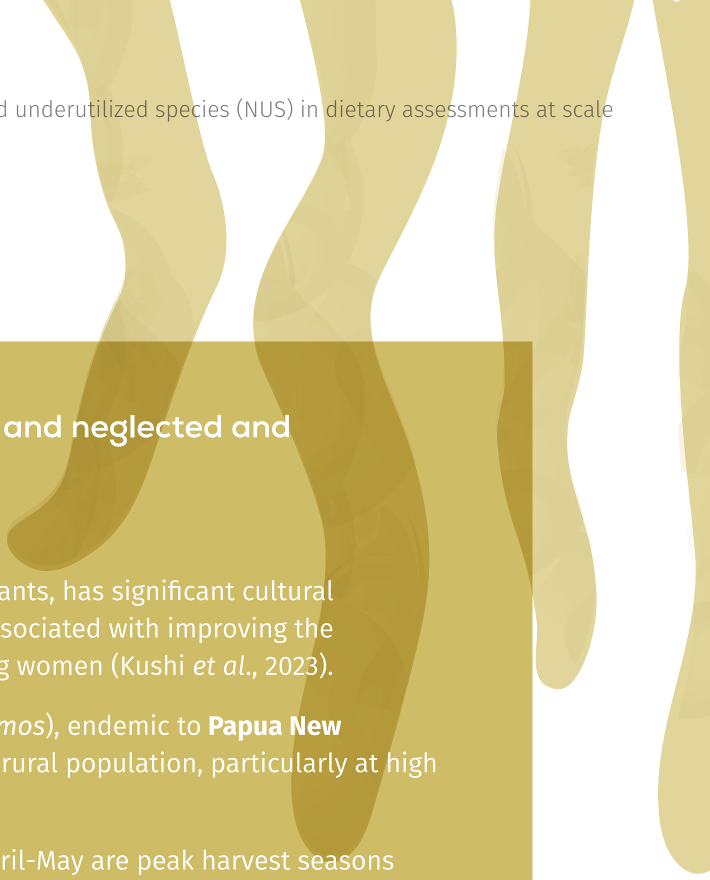
South Upi, Maguindanao – Focus group discussion on wild species and NUS consumption.



Box 2: Culturally important wild foods and neglected and underutilised species

- In **Ethiopia**, wild okra, among other wild plants, has significant cultural importance, and consumption has been associated with improving the nutritional status of pregnant and lactating women (Kushi *et al.*, 2023).
- The kernel of wild karuka (*Pandanus brosimos*), endemic to **Papua New Guinea**, is eaten by about one-third of the rural population, particularly at high altitudes (Borelli *et al.*, 2020).
- In **Uganda**, November to December and April-May are peak harvest seasons for Ruspolia differens, one of Uganda's most popular edible insects. The value of crude fats and energy is higher than those obtained from pork, chicken and beef, while flavonoids and phenols - important antioxidant compounds - are comparable to values for different fruits and vegetables, making consumption critical for children and women of childbearing age (Kababu *et al.*, 2023).
- In **Nepal**, stinging nettle (*Urtica dioica L.*), a source of calcium, iron, protein, phosphorous and vitamins A and C, is widely cooked and highly valued for its health and medicinal properties (Bhusal *et al.*, 2022).
- **Brazil** harbours vast amounts of food biodiversity, particularly of wild, semi-wild and "forest-farmed" native fruits and nuts such as acai (*Euterpe oleracea*), buriti (*Mauritia flexuosa*), camu-camu (*Myrciaria dubia*) and brazil nuts (*Bertholletia excelsa*). These foods and systems are closely linked to diverse traditional peoples and communities. Brazil has a national plan to promote consumption of "Brazilian Socio-Biodiversity Native Food Species of Nutritional Value" for improved food security and nutrition (MoE and MoSD, 2018).
- In the **Philippines**, wild yam or "karot" (*Dioscorea hispida* Dennst.) is a nutritious indigenous root crop eaten in rural communities as rice substitute and has become a cultural heritage in the hinterlands of the Philippines. The monsoon rains in the months of June and July usher the natural yearly growth of karot in the mountain municipalities. Indigenous Peoples survive the odds of lean months usually during the third quarter of the year waiting for the rice harvest by hunting wild yam (Raras and Malinnag, 2004).
- In **Türkiye**, wild food plants, especially in rural areas, are collected and eaten or sold in local markets, complementing people's diets and incomes. Evidence shows that for some micronutrients, wild species like knotgrass (*Polygonum cognatum*) and watercress (*Nasturtium officinale*) are nutritionally equivalent or superior to cultivated counterparts (Borelli *et al.*, 2022).

Sources: See References.

STEP 5

Build capacities

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STEP 5

Build capacities

Enumerators and supervisors should be fully prepared to correctly probe for wild foods and NUS and ensure consistent application of methods. Training is critical to overcome challenges such as stigma, confusion over definitions, and quantification challenges.

Consider training enumerators and trainers to:

- **Clearly define "wild foods" and NUS** to avoid confusion and/or double counting (see **definitions**). Given difficulties drawing the line between wild and domesticated, and due to intermediate stages of domestication, emphasis should be placed on the practice of **gathering** foods not grown intentionally as a proxy for "wild". The term NUS may be more challenging to communicate to IP&LCs who may regularly consume "NUS" species. The process of multisectoral and multi-stakeholder consultations (**Step 2**) and generation of robust reference tools that include key NUS (**Step 3**) prior to the data collection are vital to overcome definitional challenges and proper species identification.
- **Train supervisors to use consistent application of methods and food classification.** Relatedly, supervisor training is important for several reasons, including ensuring that the agreed methodology for data collection is uniformly applied and the quality of data collected meets standards, particularly for species and/or food classification, if relevant.
- **Use culturally appropriate approaches.** Build capacities on community-sensitive approaches and methods such as "Free, Prior and Informed Consent" (FPIC).
- In particular for the open 24-hour recall method, enumerators should be trained to **probe for gathered foods sensitively and reduce or avoid stigma**. Respondents have been known to underreport socially undesirable or illegal practices. Gathering wild food plants or hunting

game may in turn be underreported because of perceptions that they are famine foods, or because hunting may be illegal in certain areas. Particularly when applying the open-recall method, enumerators should be trained to probe for wild foods through the lens of gathering to counter respondent hesitancy and elicit responses on collection practices.

- **Explain portion thresholds.** Train enumerators to count or not to count "gathered" foods towards dietary diversity, which are habitually consumed in ≥15-gram or <15-gram quantities, respectively. The latter should be classified under the "condiments and seasonings" or optional "wild food group", if applicable. A full record of food items is particularly useful when the survey aims to understand the consumption of specific foods items or food groups that do not count towards dietary diversity, or subdivisions of dietary diversity food groups – for instance: some types of meats, poultry, and fish, different types of vegetables and specific wild foods. Should the respondent have difficulty remembering the name of a "gathered" food name, other family members can be enlisted for help.

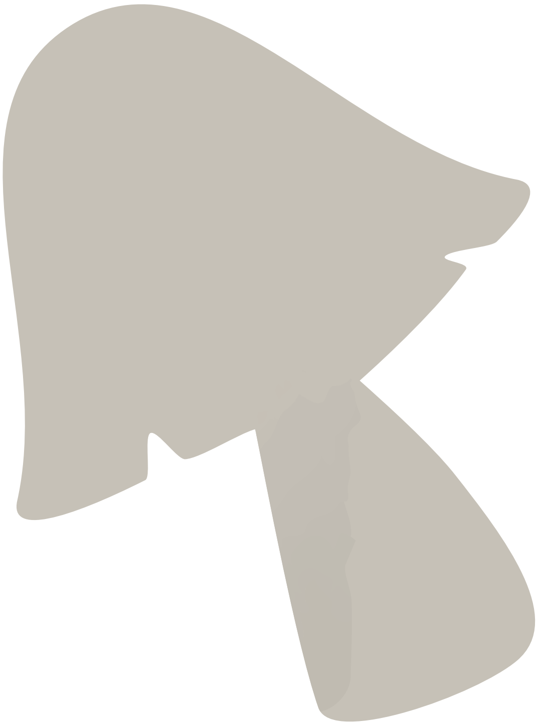
Dealing with quantification challenges and limitations:

The **lack of food composition data** on wild or forest foods (in particular below the species -level) causes issue for objective categorization of foods into their respective food groups, based on the a priori set minimum nutrient density criteria (e.g. 120 Retinol Equivalents or 60 Retinol Activity Equivalents/100 g for vitamin A-rich foods). For example, in the absence of information regarding their nutrient content, "gathered" leaves that are medium-to-dark green can be assumed to be vitamin A-rich and placed in this group (FAO, 2017).

It is essential moreover to consider that **no food or ingredient is placed in more than one food group.** Nevertheless, various edible parts of wild, NUS, and forest foods can "count" towards numerous foods groups (e.g. amaranth seeds and greens in the "cereals" and "dark green leafy vegetables" food groups, respectively). Therefore, a key limitation is that the consumption of one species, variety, or cultivar might contribute to "gathered" food intake across multiple food groups. Mixed dishes and food items with multiple ingredients are a particular challenge. During the enumeration of dietary diversity, careful considerations are necessary to decide which ingredients (e.g. gathered foods) should be classified into groups where they can "count" towards the dietary diversity, and which should be classified under "condiments and seasonings" (WHO, 2021). Enumeration should err on the side of caution, to avoid inflating food group diversity. More research on nutrient composition of wild foods and local uses, including preparation methods, may allow for future inclusion of additional wild or forest food groups with particularly relevant nutritional profiles for populations. (Refer to FAO, 2021, p.19, 30).

Guidance

Clearly define "wild foods" and NUS. Use culturally appropriate approaches, including informed consent. Probe for gathered foods sensitively and reduce/avoid stigma. Explain portion thresholds, and train supervisors to use consistent application of methods and food classification.



Box 3: Nutrient composition

A key aspect to reinforce the importance of wild species is the knowledge of their nutrient composition. To improve the evidence-base of the importance of biodiversity to nutrition, nutritional indicators for biodiversity on food composition (FAO, 2008) and food consumption (FAO, 2011) were developed. The indicator on food composition simply counts the number of foods for which at least one value for a nutrient or bioactive component is available, and the food is described sufficiently to identify genus, species, subspecies, and variety, cultivar, or breed. Additionally, as there was no collection of compositional data available on foods counting for biodiversity, FAO in collaboration with INFOODS has developed the FAO/INFOODS Food Composition Database for Biodiversity (BioFoodComp). The database is a compendium of scrutinized analytical data (without any additional estimations, imputation, or calculation of missing values). While previous versions have been published, the FAO/INFOODS Food Composition Database for Biodiversity version 4.0 compiled composition values for foods at within-species level (i.e. variety/cultivar/breed level) and for wild and underutilized foods (FAO, 2017). This latest version (4.0) contains data on 10 156 foods, of which 3 118 (31 percent) are identified as wild plant and animal foods (belonging to more than 1 200 species). The entire database is available in an MS Excel format and can be downloaded free-of-charge with the user guide from the FAO/INFOODS website (see FAO/INFOODS Food Composition Databases).

Sources:

FAO. 2011. Expert Consultation on Nutrition Indicators for biodiversity. *Food Consumption.*

FAO. 2017. FAO/INFOODS. *Food Composition Database for Biodiversity Version 4.0 - BioFoodComp 4.0.* Rome.

STEP 6

Analyse and present data

Forest Foods in the Area (Men)
DAHON
KAWAT
FUSUW
DEDEF
UBOFTULOOK
KEROT
FAGAW
BLANGAS
KUTOT
UDHOL
FEFRAS
UBE LATE
MAHFAY
AGUH
EBEH
KBOG
FISH
ANIMALS
DEDEG
KULOT BAKUK
EFENGON
MEROL
ODON
BELOLO
CABIKET
FAK
(Women)

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STEP 6

Analyse and present data

In addition to the recommended approach for dietary diversity score (DDS) surveys, the dietary assessment of wild and forest foods can be presented as:

- The proportion (%) of respondents who consumed gathered foods or NUS ≥15 grams (MDD-W);
- The proportion (%) of respondents who consumed gathered foods or NUS from any of the 10 food groups;
- The list of wild foods and NUS consumed per MDD-W food group.

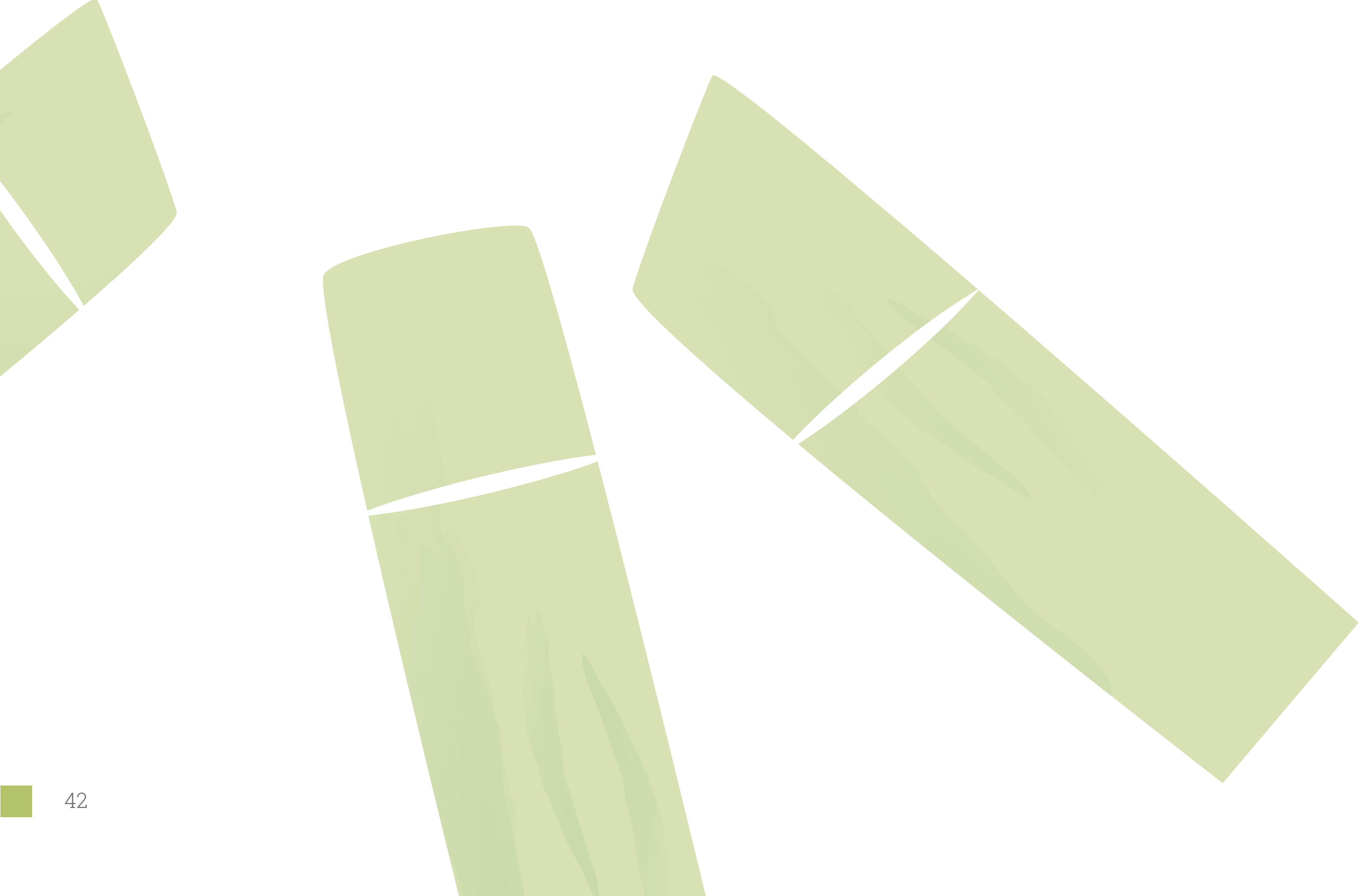
In the context of MDD-W, intuitively, the exclusion criteria of <15 grams seems counterproductive to the exercise at hand, which is inherently difficult to reconcile with the rationale behind simple proxies such as the MDD-W data-collection methods. Nonetheless, a study indicated that women of reproductive age (15-49 years), for whom MDD-W was validated, consumed NUS in at least 15 grams in 90.7 percent of the cases among consumers (Hanley-Cook *et al*., 2020). Most NUS were classified under either the “vitamin A-rich fruits and vegetables” or “other fruits” food groups. For other validated food group questionnaires such as Minimum Dietary Diversity 6-23 months (MDD) and household Dietary Diversity Score (HDDS), there are no minimum quantity criteria for a “gathered” food items to “count” towards a food group.

Additional Considerations:

- Determine the contribution of wild foods and NUS to diets relative to other foods and explore correlations of consumption with Dietary Species Richness or Food Species Richness metrics.
- Disaggregate by gender where possible.
- Acknowledge data limitations (especially nutrient composition).
- Use culturally significant examples and highlight seasonal patterns.

Guidance

Analyse the percent of respondents who consumed gathered foods or NUS above the portion thresholds, from any of the MDD-W food groups, and generate a list of gathered foods and NUS per food group to understand the relative contribution to diets.



STEP 7

Plan for future improvements

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STEP 7

Plan for future improvements

Beyond a single survey, consider improving long-term capacity and evidence generation on wild and underutilized foods. This step involves planning investments, building cross-sectoral collaborations, and institutionalizing biodiversity monitoring.

Decision makers in the field of agriculture, forestry, health and nutrition may consider:

- Enriching **food composition** databases with data on wild foods and NUS;
- Refining methodologies for **quantifying their nutritional contributions**;
- Documenting **local and traditional uses**;
- Improving **inventorying and monitoring** of wild foods and NUS in natural habitats;
- Developing **conservation or domestication strategies** as appropriate to ensure sustainable use;
- Identifying **motivations** for the consumption of wild foods and NUS to improve understanding of their use (e.g. culture, income, hunger) and enhance their contribution to improving nutrition outcomes;
- Institutionalizing **cross-sectoral collaboration and monitoring** (agriculture, forestry, health, nutrition) at a national level to optimize their contribution to relevant global nutrition, biodiversity and climate goals;

- Linking data on wild foods and NUS to reporting under **global development strategies and frameworks** such as the Sustainable Development Goals (SDGs), Convention on Biological Diversity, Global Biodiversity Framework (GBF) and climate frameworks.
- Communication of data collected and documented through other relevant channels including such as revising National Biodiversity Strategies and Action Plans (NBSAPs), reporting against relevant Global Biodiversity Framework (GBF) targets and revising Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs).

Guidance

Improve data integration and collaboration across sectors in support of national and global development strategies and frameworks related to health, nutrition, biodiversity and climate.

Case studies

CASE STUDY 1

Philippines: Pilot on capturing wild foods and neglected and underutilized species in the National Nutrition Survey

Javier, C., Agdeppa, I., Muir, G., Goyena, E., Joy, A., Escote, J.Z., Ducay, A.J.D. and Pastores, C.

In 2024, the Philippines' Department of Science and Technology-Food and Nutrition Research Institute (DOST-FNRI), in collaboration with FAO, piloted different approaches to capturing consumption of food biodiversity in the National Nutrition Survey. The country routinely employs gold standard dietary assessment methods such as 24-hour recalls and one-day household food weighing. However, adjustments were made to existing questionnaires to capture greater food biodiversity with the support of background data collected. In addition, HFFQ were administered to capture qualitative data on wild foods and NUS consumed, motivations behind gathering, and preparation and processing methods. Prior to data collection, a wild food catalogue was developed with the support of experts from different sectors (the forest, agriculture, and academic sectors, as well as Indigenous Peoples representatives), to facilitate data collection for the food consumption component of the National Nutrition Survey. The catalogue was used to update the electronic Dietary Data Collection System (eDDCS), where an initial food list of wild foods and neglected and underutilized species was integrated based on existing literature, expert consultations, and food items encountered during the pretesting to assist the data collectors in choosing which food items were consumed by the households in the HFFQ. Additional food items were added to the database as enumerators encountered unfamiliar food items which were then matched with published literature during the actual data collection and during data analysis. The results were consolidated into an initial list for inclusion and updating in the eDDCS, which can now be utilized to support future data collection.

Source: **FAO & FNRI.** 2025. [unpublished project document]. *Pilot on capturing wild foods and NUS in dietary assessment at scale.*

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Interview for HFFQ on wild foods and NUS, Antique

© FNRI

Interview for additional food recall, Palawan

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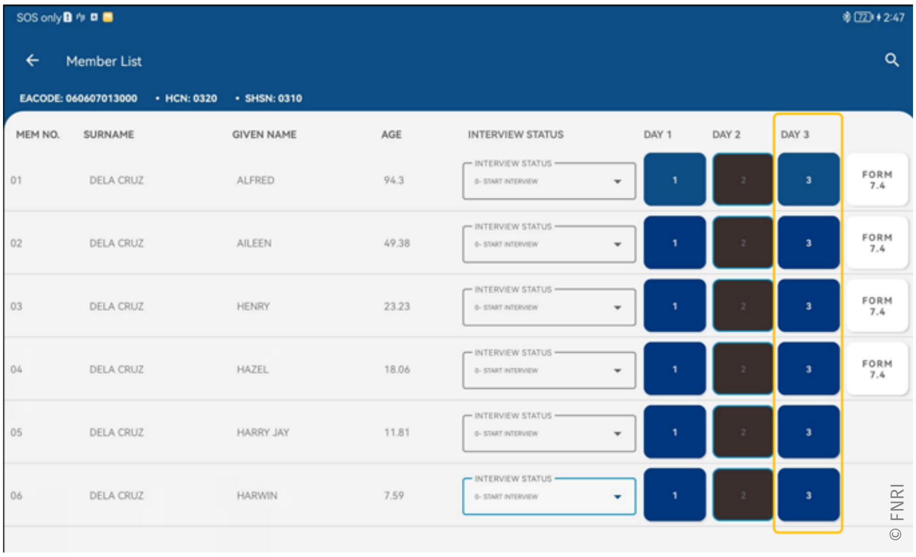
Food weighing of *takway ng gabi*, Antique



Member List

EACODE: 060607013000 • HCN: 0320 • SHSN: 0310

MEM NO.	SURNAME	GIVEN NAME	AGE	INTERVIEW STATUS	DAY 1	DAY 2	DAY 3	
01	DELA CRUZ	ALFRED	94.3	INTERVIEW STATUS: 0- START INTERVIEW	1	2	3	FORM 7.4
02	DELA CRUZ	AILEEN	49.38	INTERVIEW STATUS: 0- START INTERVIEW	1	2	3	FORM 7.4
03	DELA CRUZ	HENRY	23.23	INTERVIEW STATUS: 0- START INTERVIEW	1	2	3	FORM 7.4
04	DELA CRUZ	HAZEL	18.06	INTERVIEW STATUS: 0- START INTERVIEW	1	2	3	FORM 7.4
05	DELA CRUZ	HARRY JAY	11.81	INTERVIEW STATUS: 0- START INTERVIEW	1	2	3	
06	DELA CRUZ	HARWIN	7.59	INTERVIEW STATUS: 0- START INTERVIEW	1	2	3	

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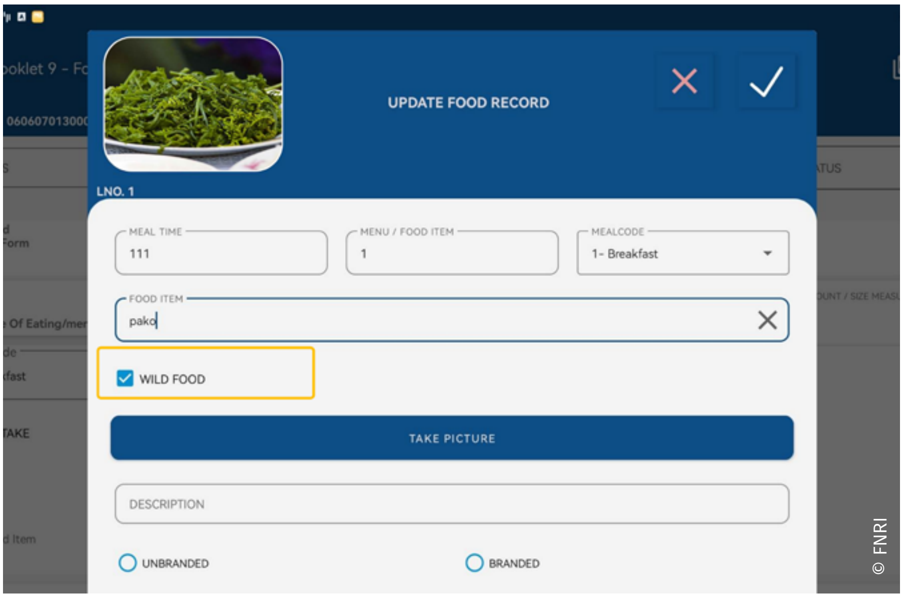
Sample of a food being ticked as “wild foods” (i.e. gathered) in the food record form



LNO. 1

MEAL TIME: 111

MENU / FOOD ITEM: 1

MEALCODE: 1- Breakfast

FOOD ITEM: pako

☑ WILD FOOD

DESCRIPTION

○ UNBRANDED ○ BRANDED

© FNRI

“Day 3” for the food recall appearing after a food item in the food record form was ticked as “wild foods” (i.e. gathered)

Source: **FAO & FNRI.** 2025. [unpublished project document]. *Pilot on capturing wild foods and NUS in dietary assessment at scale.*

CASE STUDY 2

Cameroon, Papua New Guinea, Paraguay, Philippines and Viet Nam: Strengthening forest-sector contributions to healthy and sustainable agrifood systems

A FAO Technical Cooperation Programme (TCP) Project in Cameroon, Papua New Guinea, Paraguay, the Philippines and Viet Nam strengthened institutional capacities to support and upscale interventions to enhance the contributions of forests, trees and wild species to healthy and sustainable agrifood systems. A key output of the project was to generate rapid assessments of wild species, “forest foods” and associated systems. Data and information were generated in close collaboration between plant science, agriculture, forest, and nutrition/health sectors, in addition to key stakeholders such as Indigenous Peoples and Local Communities. The aim was to institutionalize data integration, thereby improving accounting of food biodiversity in dietary assessments in each country, and at the same time support monitoring of biodiversity targets. The rapid assessments serve as baseline inventories and tools to support future country data collection on food biodiversity, land-use planning and country reporting to international frameworks ssuch as the SDGs, the CBD and GBF.

To institutionalize data integration across sectors, in Papua New Guinea, a pilot is underway to integrate wild food plants into National Forest Inventorying monitoring efforts. In addition to supporting monitoring of biodiversity trends (e.g. GBF such as Target 9), the inventory will also serve as a valuable tool to support food consumption surveys and monitoring of SDGs.

For more information, please see: https://www.fao.org/forestry/nwfp/projects/project-detail/project-number-1/en

December
November
May
April
March
June

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CASE STUDY 3

Thailand: Insights on community-engaged research and dietary assessment

Chotiboriboon, S:, Gowachirapant, S., Joompa, P., Kongpunya, P., Thongkam, N., Sapsuwan, C., Sirisai, K.B.S., and Kriengsinyos, W.

The Pwo Karen community, living in the western region of Thailand, maintain a close relationship with nature through a food culture based on the diverse ecosystems of their natural environment (Chotiboriboon *et al*., 2009). A multidisciplinary research team from the Institute of Nutrition, Mahidol University, collaborated with the community and networks to conduct the RISE project (García Molinos, J. *et al*., n.d.; García Molinos, J. *et al*., 2022). The community team was involved from the outset, reflecting their role as active citizens capable of studying and restoring forest foods. The research process served as a platform for knowledge exchange between youth and elders in the community.

The process began with the research team identifying an interested community team, consisting of youth and adults—mostly women—who already possessed knowledge of local foods, food gathering and cooking. This helped in understanding the community's dietary consumption.

Development of research tools included a three-month food frequency questionnaire (FFQ) and a food photobook. The research team compiled a list of food items from a 2005 study (Chotiboriboon *et al*., 2009), while the community team helped verify the continued existence of each food item, check consistency between the food items, pictures, and names in both Thai and Thai-transcribed Karen. The photo book helped ensure shared understanding of food items among respondents and interviewers and aided in recalling past consumption patterns. Compiling taxonomic information on the plant and animal species covered in the survey is a necessary step to obtain permission from the Thai government to analyse the nutrient composition of traditional foods.

Once the tools were finalized with mutual understanding, the research and community teams jointly planned and collected seasonal dietary data. Regular discussions between the research team and the community team during data collection helped verify comprehension and data accuracy, as well as connect dietary data with the status of native plants—whether persisting or disappearing—while raising awareness about the value of traditional foods.

Data return: After the data analysis, the community team helped review the research findings and presented the results to the community, fostering a sense of ownership of the research outcomes.

Youth-led initiatives: By integrating participatory action research (Chotiboriboon *et al*., 2024), the research team provided opportunities for youth team members—who had been involved in data collection—to learn about traditional foods and recognize the impacts of climate change on the food system. Realizing the value and decline of local plants, youth groups initiated a project to propagate large village trees to stabilize riverbanks eroded by strong currents during heavy rains. These trees also serve as a food source for both community members and aquatic animals.

Conclusion: The Pwo Karen community faces challenges that threaten its food system and natural resources. However, the community's capabilities—particularly those of women and youth—combined with traditional knowledge, openness to new knowledge, and the ability to initiate projects, reflect the community's potential to build a sustainable food system.

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Co-development of a food frequency questionnaire by the research and community teams

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Brainstorming by the community team to develop a forest plant restoration project

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The community team assisted in conducting food frequency interviews

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Forest tree propagation by youth

Appendices

APPENDIX 1

Which dietary assessment method to use?

Method	Strengths	Weaknesses
Dietary diversity questionnaire (DDQ) (individual/household)	• Quick, low burden tool assessing dietary diversity, which is a proxy indicator for micronutrient adequacy; • Comparative advantage as it is widely rolled out in hundreds of countries, is scalable and can be incorporated into other sectoral surveys (e.g. household consumption and expenditure); • Simple and minor adaptations can be integrated to generate more data at a scale on consumption of specific wild foods or NUS, or associated food groups (e.g. wild green leafy vegetables) or food source codes for gathering; • MDD-W is a new SDG indicator to monitor the variety of foods we consume. It is increasingly being employed by countries to track progress towards ending malnutrition and achieving SDG 2 (Zero Hunger).	• Unlikely to yield granular data on biodiversity (e.g. species level) for all species consumed, only for most popular/"sentinel" wild food plants and NUS; • Limited capacity to assess nutrient adequacy of diet.
Minimum Dietary Diversity for Women (MDD-W, MDD-C) (children, women of reproductive age)		
Food frequency questionnaire (FFQ)	• Can be used to assess intake over longer periods of time, overcoming seasonality issues, and to capture a range of foods; • Simple to administer; • Low respondent burden; • Choice of foods in the food list can be tailored to capture wild/NUS.	• Does not generate precise information on quantities consumed; • Long recall periods may lead to misreporting.
Household consumption and expenditure surveys	• Inexpensive, has large samples, statistically representative at a national/subnational level, routinely conducted and easily adapted; • Increasingly being used to address food and nutrition information gap; • DD and MDD can easily be integrated.	• Unlikely to yield granular data on biodiversity (e.g. species level); • Limited capacity to assess nutrient adequacy of diet.
24-hour recall	• Reference Standard - greater accuracy, can capture species-level information; • Can assess intakes of a large population.	• Requires skilled interviewers; • Expensive, not appropriate nor accessible in low-resource settings; • Unlikely to capture seasonal foods; • May not capture foods eaten less frequently.
Weighed food records	• Gold standard for dietary assessment; • Most precise method for estimated food and nutrient intakes.	• High respondent burden; • Expensive; • Unlikely to capture seasonal foods • May not capture foods eaten less frequently.
Dietary history	• Useful to describe food intake over a long period of time (helpful in capturing seasonal foods); • Provides quantitative estimates.	• High respondent burden; • Requires trained personnel, expensive, difficult to capture detailed information at scale.
Biological inventory surveys	• Useful for developing food lists which reflect local biodiversity and have the added value of being botanically validated; • They can also be a useful reference for enumerators using open-recall methods. • Can be carried out at longer intervals.	• Do not reflect food consumption; • Expensive and time consuming.

Sources:
FAO. 2018. Dietary Assessment: A resource guide to method selection and application in low resource settings. Rome;
FAO & The World Bank. 2018. Food Data Collection in Household Consumption and Expenditure Surveys. Guidelines for Low- and Middle-Income Countries. Rome.

APPENDIX 2

Sample Template – Focus group discussions with IP&LCs

Key Wild Species and NUS

Notes:

- Depending on group characteristics and size, meta cards can be used to generate food lists and identify parts/organs used by food group.
- ***Facilitator should probe by food groups*** *e.g. Fruits; Nuts & Seeds; Vegetables (e.g. wild leafy vegetables, dark green leafy vegetables, roots, tubers); Edible Mushrooms; Insects; Terrestrial Meat and Animal Products (e.g. game, eggs); Fish (fresh water) and Aquatic Resources (e.g. crabs); Medicinal and Aromatic Plants; Honey/Apiculture Products*

NB. Enumerator should review definitions to avoid confusion over the scope of the data collection.

Food Item (local/ common name)	**Scientific Name (if available)**	**Parts/ organs used**	**Cultivation status** 1 = mostly wild (i.e. gathered, collected) 2 = semi-wild (subject to some degree of management to enhance production) 3 = mixed production systems (e.g. gathered and managed or domesticated) 4 = mostly farmed (crop), cultivated intentionally	**End use** 1 = domestic consumption (food, medicine) 2 = sale; 3= other	**Main processing/ cooking/storage techniques used** 1 = boiling 2 = roasting 3 = drying 4 = fermenting 5 = other (specify:___)	**Who collects/ harvests?** (Men, women, youth)	**Harvesting season/ month**	**Motivation for consumption** 1= culture 2=health/ nutrition 3 = hunger 4 = other
Vegetables (leafy greens, etc).								
1.								
2....								
Fruits								
1.								
2...								
Nuts/Seeds								

Source: **Muir, G., Fallas-Conejo, D., Sorrenti, S. & Walter, S.** 2024. *[Unpublished project document]*. Rapid Assessment of Priority Forest Foods & Systems Methodology.

APPENDIX 3

Baseline inventory of wild foods and NUS

Food item (scientific name)	**Family**	**Local names**	**Common name**	**Parts/ organs used**	**Preparation /storage methods**	**Food Group(s)***	**Geographic Distribution** (region/ agroecological zone)	**Cultivation status****	**Sources/ available data sets**
Diplazium esculentum	Athryiaceae	*Pako/ Pako, Pak-paku, Apako*	[Fiddlehead] fern, vegetable fern	Fronds	Mostly boiled	Vegetable	Present on all three main island groups, both lowland and highlands	(1) Mostly wild; some semi-domestication practised by women who commonly harvest the fronds	**Iveg - Pako**

*To the extent possible, classify into one of the 10 MDD-W Food Groups. If unsure, use generic classification e.g. "vegetable", "fruit", etc.

** 1 = mostly wild (i.e. gathered, collected)
2 = semi-wild (subject to some degree of management to enhance production)
3 = mixed production systems (e.g. gathered and managed or domesticated)
4 = mostly farmed (crop), cultivated intentionally

Source: **Muir, G., Fallas-Conejo, D., Sorrenti, S. & Walter, S**. 2024. [*Unpublished project document*]. Rapid Assessment of Priority Forest Foods & Systems Methodology

APPENDIX 4

Markey Survey Template

ADMINISTRATION and MARKET PARTICULARS			
Date		Town	
Time Start		Municipality	
Time End		Province	
Survey Administrator		Name of Market	
Name of Vendor		GPS coordinates	Lat.
Type of Vendor			Lon.

A. WILD FOODS AND NUS SOLD, PRICE, WEIGHT, SOURCES AND USES

Item ID	**Item name** **(local, if available)**	**Common or scientific name, if available**	**Unit being sold** **(basin, cup, jar, ...)**	**Size** **(small=1, medium=2, large=3, N/A)**	**Condition: S=shelled; U=unshelled; F=Fresh; D=Dry; O=other, please specify**	**Weight (in kg)**	**Quantity (in L)**	**Unit Price**	**Use(s)**	**Main source (local; country; neighbouring countries)**
Item 1										
Item 2										
Item 3										

B. ANNUAL TRENDS, CHANGES IN SUPPLY AND DEMAND

What are the most important wild food or NUS sold during last year?	What has been the demand/sales trend in the past three years? *(1) Increased* *(2) Declined* *(3) No change*	What has been the supply trend (availability) in the last three years? *(1) Increased* *(2) Declined* *(3) No change*	What has been the trend in market price in the past three years? *(1) Increased* *(2) Declined* *(3) No change*
1.			
2.			
3.			
4.			
5.			

Source: **Muir, G., Fallas-Conejo, D., Sorrenti, S. & Walter, S**. 2024. [*Unpublished project document*]. Rapid Assessment of Priority Forest Foods & Systems Methodology

APPENDIX 5

Sample harvest calendar (Philippines, 2024)

Notes

- Have participants freely list main wild foods and NUS consumed. Make sure to explain terms thoroughly. Meta cards can be handed out to ensure full group participation.
- Ask participants to note food acquisition sources (e.g. gathered, cultivated or purchased, for example).
- Ask participants to place foods under the month when it is in season. If the harvest period spans different months, ask participants to place them under multiple months, noting the peak harvest period if available with a different color or meta card, for example.
- When local names and languages are utilized, provide discussion time to collect information that can support species identification, such as asking participants to provide samples where possible, or identifying common names for the same species.
- The exercise can also be conducted by food group to ensure all food groups are well represented (e.g. Vegetables - leaves, flowers, stems, shoots), roots and tubers, fruits, nuts, fungi, other (apiculture products, wild game) (see sample calendar below).

VEGETABLES (leaves, fronds, flowers, stems, shoots, etc.)

	Local name(s)	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Diplazium esculentum	*Pako*				▨	▨	▨	▨					
Dioscorea spp.	*Labo-o,* *Karot*	▨	▨	▨	▨	▨							▨
Homalomena philippinensis	*Pikaw,* *Payaw*	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Bambusa blumeana	*Labong*					▨	▨	▨	▨	▨			
Broussonetia luzonica	*Himbabao*	▨	▨	▨	▨	▨							▨
Amaranth spp.	*Uray*	▨	▨	▨	▨	▨							▨
Abelmoschus manihot	*Lagikway*					▨	▨	▨	▨	▨	▨		
Stenochlaena palustris	*Diliman*					▨	▨	▨	▨	▨	▨		
Senna tora	*Kamantulan*	▨	▨	▨	▨	▨							▨
Alternanthera sessilis	*Lupo-lupo*					▨	▨	▨	▨	▨	▨		

harvest period ▨

Source: **Muir, G., Pastores, M., Javier, C., Razal, R., Castroverde, H., Agdeppa, I., Altoveros, N., Reyes, R. and Cervancia, C**. 2026. *From ferns to fungi: Wild food plants and forests foods in the Philippines: A Rapid Assessment*. Rome, FAO.

APPENDIX 6

Separate food source codes for gathering, [hunting, and fishing]

Food Consumption Score

How many days over the last 7 days, did most members of your household (50% +) eat the following food items, inside or outside the home? And what was their source?

		Number of days eaten in the past 7 days **If 0 days, do not specify the main source**	**How was this food acquired?** **Write the main source over the past 7 days**
1.	Cereals, grains, roots and tubers, such as: rice, pasta, bread, sorghum, millet, maize, potato, yam, cassava, white sweet potato, plantain	|____|	|____|____|____|____|
2.	Pulses/legumes, nuts and seeds, such as: beans, cowpeas, lentils, soy, pigeon pea, peanuts, or other nuts	|____|	|____|____|____|____|
3.	Milk and other dairy products, such as: milk, yoghurt, cheese, and other dairy products [Exclude margarine/butter or small amounts of milk for tea/coffee]	|____|	|____|____|____|____|
4.	Meat, fish and eggs, such as: goat, beef, chicken, pork, fish, canned tuna, insects, escargot, other seafood, eggs [Exclude meat and fish consumed in in small quantities as a condiment]	|____|	|____|____|____|____|
5.	Vegetables and leaves, such as: spinach, onion, tomatoes, carrots, peppers, green beans, lettuce	|____|	|____|____|____|____|
6.	Fruits, such as: bananas, apples, lemon, mango, papaya, apricot, peach	|____|	|____|____|____|____|
7.	Oil, fat and butter, such as: vegetable oil, palm oil, shea butter, margarine, and other fats/oil	|____|	|____|____|____|____|
8.	Sugar and sweets, such as: sugar, honey, jam, candy, cookies, pastries, cakes, sugary drinks and other sweets	|____|	|____|____|____|____|
9.	Condiments, such as: tea, coffee, cocoa powder, salt, garlic, spices, yeast, baking powder, tomato paste or sauce, and small amounts of meat, fish, milk or other food items consumed as a condiment	|____|	|____|____|____|____|

Food acquisition codes
100 = Own production (crops, animal)
200 = Fishing/hunting
300 = Gathering
400 = Loan
500 = Market (purchase with cash)
600 = Market (purchase on credit)
700 = Begging for food
800 = Exchange labour or items for food
900 = Gift (food) from family relatives or friends
999 = Other
1000 = Food aid from civil society, NGOs, government, WFP, etc.

The *World Food Programme's Vulnerability Analysis and Mapping: Food Security and Nutrition Assessment questionnaire.* (Section G: Household food sources and consumption) contains a unique food acquisition code for gathering. Source: **World Food Programme**. 2024. *Vulnerability Analysis and Mapping: Food Security and Nutrition Assessment questionnaire.* https://docs.wfp.org/api/documents/WFP-0000108055/download/

APPENDIX 7

India: Food source code for “free collection”

Consumption of edible oil, egg, fish and meat, vegetables, fruits, spices, beverages and processed food and pan, tobacco and intoxicants during the last 7 days ended on				
Item	**Code**	**Consumption out of home produce**	**Total consumption**	**Source***
Potato	210			
Onion	211			
Radish	212			
Carrot	213			
Turnip	214			
Beet	215			
Sweet potato	216			
Arum	217			
Pumpkin	218			
Gourd	219			
Bitter gourd	220			
...	...			
Palak/other leafy vegetables	232			
Other vegetables	242			

* Source code: only purchase –1, only home-grown stock –2, both purchase and home-grown stock –3, only free collection –4, only exchange of goods and services –5, only gifts / charities – 6, others –9

The Household Consumer Expenditure Survey conducted in India (2009-2010) contains a unique food source code for “only free collection” (i.e. gathering). Source: **Government of India**. 2013. *Perceived Adequacy of Food Consumption in Indian Households (July 2009-June 2010). Ministry of Statistics and Programme Implementaiton.* https://microdata.gov.in/NADA/index.php/catalog/123/download/1267

APPENDIX 8

Benin: Closed food list

LIRE LE NOM DE CHAQUE PRODUIT

ECRIRE LA REPONSE POUR CHAQUE PRODUIT A 7B.02 AVANT DE POSER LES QUESTIONS 7B.03 A 7B.08

Libellé des Produits

VIANDE

- Viande de bœuf
- Viande de chameau
- Viande de mouton
- Viande de chèvre
- Abats et tripes (foie, rognon, etc.)
- Viande de porc
- Poulet sur pied
- Viande de poulet
- Viande d'autres volailles domestiques
- Charcuterie (jambon, saucisson), conserves de viandes
- Gibiers
- Autres viandes n.d.a.

LEGUMINEUSES ET TUBERCULES

- Petits pois
- Petit pois secs
- Autres légumes secs n.d.a.
- Niébé-Haricots secs
- Arachides fraîches en coques
- Arachides séchées en coques
- Arachides décortiquées ou pilées
- Arachide grillée
- Pâte d'arachide
- Sésame (goussi)
- Noix de karité
- Noix de cajou
- Manioc
- Igname
- Plantain
- Pomme de terre
- Taro, macabo
- Patate douce
- Autres tubercules n.d.a.
- Farines de manioc
- Gari, tapioca
- Attiéke

LÉGUMES

- Salade (laitue)
- Choux
- Carotte
- Haricot vert
- Concombre
- Aubergine, Courge/ Courgette
- Poivron frais
- Tomate fraîche
- Tomate séchée
- Gombo frais
- Gombo sec
- Oignon frais
- Ail
- Feuilles d'oseille
- Feuilles de baobab
- Gboman
- Ademe (Ninnouwi)
- Feuillle de manioc, Haricot, Moringa
- Autre légumes frais n.d.a.
- Concentré de tomate

HUILES ET GRAISSES

- Beurre
- Beurre de karité
- Huile de palme rouge
- Huile d'arachide
- Huile de coton
- Huile de palme raffinée
- Autres huiles n.d.a. (maïs, soja, huile palmiste, etc.)

The food list in the *Living Standards Measurement Survey conducted in Benin* (2018-2019) contains food items such as wild game (gibiers), shea nuts (noix de karité), baobab leaves (feuilles de baobab), moringa and shea butter (beurre de karité). Source: **Institut National de la Statistique et de l'Analyse Économique (INSAE).** 2022. *Enquête Harmonisée sur le Conditions de Vie des Ménages 2018-2019, Benin.* https://microdata.worldbank.org/index.php/catalog/4291/related-materials

APPENDIX 9

Malawi

Over the past one week (7 days), did you or others in your household consume any [. . .]?	G01 YES..1 NO...2>> NEXT ITEM	G02 ITEM CODE
INCLUDE FOOD BOTH EATEN COMMUNALLY IN THE HOUSEHOLD AND THAT EATEN SEPARATELY BY INDIVIDUAL HOUSEHOLD MEMBERS.		
Vegetables		
Onion		401
Cabbage		402
Tanaposi/Rape		403
Nkhwani		404
Chinese cabbage		405
Other cultivated green leafy vegetables		406
Gathered wild green leaves		407
Tomato		408
Cucumber		409
Pumpkin		410
Okra/ Therere		411
Tinned vegetables (specify)		412
Mushroom		413
Other vegetables (specify)		414

Over the past one week (7 days), did you or others in your household consume any [. . .]?	G01 YES..1 NO...2>> NEXT ITEM	G02 ITEM CODE
INCLUDE FOOD BOTH EATEN COMMUNALLY IN THE HOUSEHOLD AND THAT EATEN SEPARATELY BY INDIVIDUAL HOUSEHOLD MEMBERS.		
Meat, Fish and animal products		
Eggs		501
Dried fish		502
Fresh fish		503
Beef		504
Goat		505
Pork		506
Mutton		507
Chicken		508
Other poulty – guinea fowl, doves		509
Small animals – rabbit, mice		510
Termites, other insects (Ngumbi, caterpillars)		511
Tinned meat or fish		
Smoked fish		
Fish soup/sauce		
Other (specify)		

Over the past one week (7 days), did you or others in your household consume any [. . .]?	G01 YES..1 NO...2>> NEXT ITEM	G02 ITEM CODE
INCLUDE FOOD BOTH EATEN COMMUNALLY IN THE HOUSEHOLD AND THAT EATEN SEPARATELY BY INDIVIDUAL HOUSEHOLD MEMBERS.		
Mango		601
Banana		602
Citrus – naartje, orange, etc.		603
Pineapple		604
Papaya		605
Guava		606
Avocado		607
Wild fruit (masau, malimbe, etc.)		608
apple		609
Other fruits (specify)		610

Source: Malawi's *Fifth Integrated Household Survey* (2019-2020) food consumption questionnaire includes food items such as "gathered wild green leaves" in addition to wild fruits (*masau, malimbe*); termites, other insects (caterpillars)/"*Ngumi*" and small meat/protein in their 7-day recall. Source: **Malawi National Statistics Office**. 2020. Fifth Integrated Household Survey 2019-2020. https://microdata.worldbank.org/index.php/catalog/3818 (p.41).

APPENDIX 10

Optional food groups

Sierra Leone

Section 6. **Child Health & Nutrition**	**G01** **YES..1 NO...2>> NEXT ITEM**	**G02** **ITEM CODE**
Questions and Filters	**Coding Categories**	
Any insects and other small protein foods, such as: **o) winged termite, cricket, snails, sea snails, periwinkle, African palm weevil larva, other edible insect larva?**		

Sierra Leone's 2019 Demographic and Health Survey contains a unique food group on insects and other small protein foods. Source: **Statistics Sierra Leone.** 2020. Demographic and Health Survey Sierra Leone, 2019.

Uganda

Has your household consumed any of the following foods in the last seven days? **[Indicate the number of days each of the foods have been consumed, also indicating the primary source]**
1 Cereals: Maize, maize flour, wheat flour, rice, pasta, bread and other cereals
2 White tubers and roots: Cassava, potatoes, sweet potatoes, banana plantain, tubers and other root crops
3 Pulses/legumes, seeds & nuts: Bean, peas, groundnuts, cashew nuts, and other pulses
4.1 Orange Vegetables (vitamin A rich): carrot, pumpkin, orange sweet potato, red pepper
4.2 Green leafy vegetables (iron rich): spinach, cassava leaves, Sukuma wiki
4.3 Other vegetables: tomatoes, onions, cucumber, green beans, peas, lettuce
5.1 Orange fruits (vitamin A rich): mango, papaya,
5.2 Other fruits : banana, apple, lemon, sheanuts, balanites, etc
6.1 Beef, goat, pork, chicken, donkey or camel meat
6.2 Liver, kidney, heart and other organ meats
6.3 Insects (termites, grasshoppers, crickets, others)
7 Fish: shellfish, tinned tuna, seafood, tilapia, omena
8 Eggs
9 Milk, mala, yoghurt, cheese
10 Sugar and sugar products
11 Oils (sheanuts, balanites), fat and butter
12 Condiments/alcohol: coffee, tea, salt, garlic, spices, sauces including small amounts of fish, meat, milk

The *Resilience Index Measurement and Analysis (RIMA)* survey conducted in Uganda (2019) contains a unique food group on edible insects and specific wild food items such as shea and balanites (5.2; 11) (p.11, Section G). Source: **FAO & Office of the Prime Minister of Uganda (OPM).** 2019. Resilience Index Measurement Analysis.

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